1. I would like to get your opinion on GFCIs that are required for condensate pumps. The pump is plugged into a receptacle on the furnace. It seems the GFCIs are tripping frequently and customer's basements are flooding. Could we hardwire the pumps?

   Answer: Yes, SPS 316.110(1) and NEC 210.8

   Some electrical inspectors will not allow the pump to be permanently connected as they think that this "violates" the listing of the product. One possible solution would be to "hard wire" the condensate pump. The GFCI requirement in 210.8(A) applies only receptacle outlets in unfinished basements. There may be a warranty issue with this approach but it is acceptable by our interpretation of SPS 316.110-(1) of the Wisconsin Electrical Code. If you decide to hard wire it 430.102(B) requires a disconnecting means to be installed. 430.109(B) allows the branch circuit overcurrent device to act as the disconnecting means for motors of less then 1/8 HP. These motors are typically less then 1/8 HP the largest I found was 1/20.

   SPS 316.110-(1) states "Listed or labeled equipment shall be installed or used, or both in accordance with any instructions included in the listing or labeling, provided the instructions, listing or labeling do not conflict with this chapter.

   There are many things that may "void" UL listings. Some common examples include replacing a ballast, or punching a hole in a panelboard, or cutting a raceways that was 10 feet long when listed. The key is that the product is used as intended.

2. Can I please have a clarification of the following alleged violation in the City of Madison? We have a receptacle to the right of the entry door to cover the foyer area and we have a receptacle in the hallway leading to the kitchen area. The inspector is requiring an additional three receptacles in the foyer

   Answer: Not required, NEC 2008, 210.52(H) future NEC 2011, 210.52(I)

   Our interpretation of the 2008 NEC is that a foyer is to be treated as a hallway and not living area. We would then apply Section 210.52 (H) Hallways.

   This will change with the adoption of the 2011 NEC. A new section, 210.52(I) has been added that says "Foyers that are not part of a hallway in accordance

with 210.52 (H) and have an area greater than 60 sq ft. shall have receptacles located in each wall space 3 ft or more in width and unbroken by doorways, floor to ceiling windows and similar openings." We will enforce this requirement after adoption of the 2011 NEC.

For now it is clear that foyers are treated as part of the hallway and differently than habitable rooms. The 2011 NEC will have its own section for foyers which differs from the general provision in Section (A).

3. I am bidding on some cottages (This is what the builder calls them.). They are about 10' x 20'. Inside there is only 2 bunk beds, a refrigerator, and a window AC unit. They don't have a chassis with wheels but can be moved. The cottage is intended to be supplied by a 30 amp, 240v circuit. Do the interior circuits need to be AFCI protected?

   Answer: No, NEC 210.12

   NEC 210.12 (B) says "All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways or similar rooms or areas shall be protected by a listed arc-fault circuit interrupter, combination-type, installed to provide protection of the branch circuit." That being said; we can look at the definition of a dwelling unit in accordance with the NEC.

   "Dwelling unit, A single unit, providing complete and independent living facilities for one or more persons, including permanent provisions for living, sleeping, cooking and sanitation."

   Based on the 2008 NEC and the description provided of the "cottage" AFCI protection is not required. The description is closer to a guest room in a motel rather than a dwelling.

4. Sometimes we have the masons bend up the rebar so we can connect to it above the basement floor. Are we required to make the point of connection to the rebar accessible? I would not want to have to chip out the concrete so that an inspector could see it after the pour.

Answer: No, NEC 250.68(A).

Section 250.68 (A) requires “All mechanical elements used to terminate a grounding electrode conductor or bonding jumper to a grounding electrode shall be accessible.” We then get into the exceptions which say “An encased or buried connection to a concrete-encased, driven, or buried grounding electrode shall not be required to be accessible.” The second exception allows splices of the exothermic (welded) or irreversible compression connections to be inaccessible since they are generally not subject to failure.

The Code is permissive and uses the term “shall not be required”. It is the installer’s choice since it is permitted to be buried or encased but not required. When we drive the ground rods below grade the connection is no longer accessible but also permitted by 250.68(A) Exception No. 1. It would be wise to check with the inspector before pouring the concrete. Remember UFER grounds are required to be used if installed however they are not required to be installed.

5. We are wiring an in ground pool and during the conduit inspection the inspector mentioned he wants to see the perimeter surface bond before the contractor pours the concrete patio around the pool. The pool has metal structural steel frame that extends 48” below grade and has a vinyl liner. We bonded to the frame once with a #8 bare, extended the #8 to the motor pad, and hit the hand-rail cups. The inspector states we need to install a #8 all the way around the pool 18” to 24” just below the concrete and hit the pool wall four times spaced evenly. Since the structural reinforcing steel is in contact with the concrete all around the pool edge why would we need to do any more?

   Answer: Yes. NEC 250.26(B)(2) (b).

   I see your point. Normally we would consider the steel frame to be “conductive”. However the NEC requires the “Alternative Means” of perimeter bonding with the set-up you have described. I looked first at the requirement for Conductive Pool Shells in 680.26(B)(1). Your pool has a metal frame with vinyl liner. This is not a conductive shell. The NEC indicates that for the purpose of Equipotential Bonding “Poured concrete, pneumatically applied or sprayed concrete, and concrete block with painted or plastered coatings shall be considered conductive material due to water permeability and porosity.”

On this basis, I don't think 680.26(B)(2)(a) is applicable to your situation. Therefore, the alternate means in (b) would be required.

6. We wired a new single family home in Menomonee with a finished lower level. There is a bar in the lower level. It consists of a counter top with a sink, and a wine cooler under the counter. The inspector failed the job and is requiring 2 small appliance circuits at the bar. We assume she is referring to 210.52(B) but have not received her violation letter yet. This is holding up occupancy. Are we wrong?

   Answer: The inspector is incorrect. NEC 100

   A kitchen is defined in the NEC as "An area with a sink and permanent provisions for food preparation and cooking." If there was a range or cooktop along with the sink, it would be a kitchen. A microwave is not considered a permanent provision for cooking.

   If the "bar" met the definition, it would require the small appliance circuits for the countertop. A bar (counter) sink and refrigerator do not meet the definition.

7. The house has a mound system. There is a listed sewage injection pump in the basement. The data plate on the motor indicates motor current is 8.5-amps. Can I wire it with 14 AWG Romex? Is it ok to protect it with a 20-amp breaker. It trips every time it tries to start with a 15 but runs fine on a 20.

   Answer: Yes. NEC 430.6, 430.22(A), and 430.52(C).

   NEC 430.6(A)(1), Exception No 3 requires that the nameplate current be used to calculate breaker and conductor size for a listed appliance.

   240.4(D) indicates small conductors are required to be protected per 240.4(D)(1) thru (7) unless permitted otherwise in (E) or (G). 240.4(G) tells us that the overcurrent protection of specific conductors is permitted to be provided as referenced by Table 240.4(G). This allows the use of the amperage listed in Table 310.16 for the 14 AWG Type NM cable has an allowable ampacity of 20-amperes in the 60 degree column C for this installation.

The maximum rating of the breaker is 250% of 8.5-amperes. The result is 21-amperes. Exception No 1 to 430.52(C) permits rounding up to the next standard size. So even a 25-ampere breaker would be OK.

8. I am installing a meter pedestal with two disconnects in the meter. The pedestal is mounted to the wall of the house. One circuit breaker is for the house and the other is for the future detached shop. Can I get away with a MLO panel in the house? Will I need another disconnect in the detached shop?

   Answer: Yes and Yes. SPS 316.230(4)

   The meter enclosure with the two service disconnects is on the house. The feeder to the panel in the house becomes a "subfeed". The equipment grounding and neutral conductors are separate. No main is required in the house panel if it is sized properly for the service disconnect 408.36, and the 8-foot rule does not apply since the feeder circuit to equipment in the same building is not treated like a service.

   The feeder to the separate buildings has to meet all of the applicable requirements of NEC 225-Part II. And the grounding requirements of 250.32. Kind of like starting over at the shop. No meter of course and the feeder has to have an equipment grounding conductors. But many of the other rules that apply to a service are also applicable to feeders supplying separate buildings or structures.

9. This is Tony from the Menomonee area. Is there a code class coming up in Wausau area this year? I signed up for email notification at http://dsps.wi.gov/sb/SB-DivEmailSignup.html but haven't received any notification as yet. Also I'm wiring a burglar alarm system. I have to use a transformer to get 24 volts for the security cameras. The transformer is marked "UL" and Class 2". What size fuse or breaker can I get away with?

   Answer: 20 amperes or less, NEC 725.127, http://dsps.wi.gov/sb/SB-DivEmailSignup.html

   We don't have a class planned for the Wausau area at this time. You are welcome to check the electrical education postings on our website. You can also

subscribe to electrical news by signing up on http://dsps.wi.gov/sb/SB-DivEmailSignup.html

On your transformer question. The code only allows listed power sources for class 2 circuits. If the transformer was not marked, we would assume it is Class 1. This may be OK to use but might involve protection on both the primary and secondary side.

NEC 725.127 indicates that a Class 2 transformer may be protected by an overcurrent protective device rated 20-amperes or less.

10. The inspector said I had a problem with my outside duplex receptacle and stated it is not a WR rated type, I feel she is wrong. Prior to adding this receptacle to my new addition on my house I got the advice and approval from the local big box store sales-person.

    Answer: She is correct, NEC 406.8(B)

    Per NEC 406.8 (B) page 260, she is correct it does need to be a WR type which is approved for outdoor use. It is constructed of a different type polymer composition to combat the UV rays and other effects.

11. My new mobile home that is located on our own 40 acre lot is approximately 150 feet off of the road and the electrical co-op has put in a 200 ampere 120/240volt Meter & Main panel pedestal at the road and grounded it there. The underground phone line comes from there as well. But they said they would not hook it up until an inter-system bond point is provided at that location. Due to the distance and being a separate structure do we need to provide one at the MH unit as well?

    Answer: Yes, NEC 250.94

    NEC 250.94, page 110, (250.94, page 117), yes they must be provided at both locations external to the enclosure at the service equipment and at the disconnecting means for any additional buildings or structures. Note: connector must have a means for the connection of three ISB conductors and be accessible for connection and inspection. (2011 has added or metering enclosure)

12. I was told by the inspector that after I had up-graded the electrical panel in an existing house; that I had to install CO detectors as well. I know for new houses we need them to be installed and both AC powered and battery as well as inter-connected but did not know about re-wires. Is this true?

    Answer: Yes, SPS 321

    That is correct as of February 1, 2011 all newly constructed dwelling units shall have a Co/Smoke alarm system that is powered by both line voltage and have a battery back up. For existing dwelling units; they must have CO detectors, but they can be battery back-up units only Per SPS 321.

13. At my aunt & uncles house, they have torn down the old single stall \garage and built a new 40'ft. X 80' ft. garage unit for there big boys and Girls toy's (she rides a Harley) and Motor home and things. They want me to wire it and provide an over head triplex feeder circuit over to it. But some one said I needed an approved Sun-Light resistant marking on the wire. What I got from my friend from the power company does not say anything on it nor does it indicate it is Sun-Light resistant type; but they use it all over so it must be OK correct.

    Answer: It is not OK, NEC 310.8(D) and 250.32

    310.8(D) requires cables or conductors exposed to direct rays of the sun to be listed, or listed and marked as sunlight resistant. It also must be a four wire feeder via 250.32(B). It indicates that where a separate building is supplied by a feeder or branch circuit an equipment grounding conductor shall be installed with the supply conductors. It shall be connected to a grounding electrode at the second building. That will require a quadraplex rather then the triplex you refer to.

14. In many of the new homes we are wiring there is a metal I-beam running down the center of the basement supported on the foundation wall and several posts. Do we have to bond this metal beam as required in 250.104(C)?

    Answer: No, NEC 250.104(C)

250.104(C) requires exposed structural metal that is interconnected to form a metal building frame to be bonded. This is one I-beam and does not form a metal building frame.

15. I am asked to bid on a new dwelling, with a 6 child day care unit in the basement. I am told it is to be build to the UDC standards. What illumination level do I have to provide on the two stairways going out of the basement area? Does it make a difference if one of the stairways is on the outside of the structure?

    Answer: SPS 321, IBC

    The NEC and the uniform dwelling code or UDC does not address lighting levels. 1205.4 of the International Building Code requires 1 FC on dwelling unit stairways however we do not adopt the IBC for 1 and 2 family dwellings so it would not be enforceable however I feel it would be a good guide.

16. On our new home we have a split level rear deck that is 16' X 24', approximately 5' above grade and we have installed two 1"rigid steel 10' ft. conduit on each rear corner and mounted a flood light on them with one pointing down to the rear yard and the other onto the deck and rear patio doors. The inspector says that we now must also install a light on the house at the back door. She sited NEC 210.70 (A) (2) pg. 55, as the code section that requires it. Is she correct?

    Answer: No, NEC 210.70(A)(2)(b)

    210.70(A)(2)(b) indicates at least one wall switch controlled lighting outlet is required to illuminate the exterior of outdoor entrances with grade level access, of dwelling units, attached garages, and detached garages with electric power. The exception would allow a photo-eye or motion detector. It does not require the light to be mounted on the structure next to the door. If the light you have sufficiently illuminates the entrance it is fine. Also you indicated the deck is 5' above grade. If it does not have a stairway to grade level it would not require any lighting.

17. I have a problem with an unfriendly and misinformed electrical inspector that wrote me up for not following the code for hooking up my new mobile home. My brother-in-law who knows a guy that knows electricity gave us the needed advice on the installation. It is on a permanent foundation, with a frost wall and footings; we installed a 2" steel mast and came down to a meter socket on the side of the home and then into the panel in the closet behind the socket.

    Answer: Can't do it, NEC 550.32(B)

    If the mobile home is installed on a permanent foundation you would be allowed to install the meter to the foundation wall of the home. However a disconnecting means would be required to be located before the existing panelboard in the home. 550.32(B) would allow the service equipment to be located on the home however it has 7 conditions that would need to be met in order to do this. (1) requires the home to include written installation instructions indicating the home is required to be secured to a permanent foundation. Information we have found is that mobile homes being built for Wisconsin will not have these instructions so we would have to comply with (A) of this section which will not allow the service equipment to be located on the home. Overcurrent devices are not allowed to be located in a closet however many older mobile homes did have panels in closets and they could stay if not being replaced.

18. I have a job, where they want to install embedded electric heating grid mats into the kitchen floor; do I need to provide GFCI protection for the circuit? Would it make a difference if it is 240volt versus a 120 volt system?

    Answer: No, NEC 424.44(G)

    The requirement for providing GFCI protection of heating units installed in heated floors is found in 424.44(G). It indicates GFCI protection is required where the installation is in the floor of bathrooms and in hydromassage bathtub locations. This section makes no mention of the supply voltage so they would require GFCI protection for 240 as well as 120 volt. The 2011 code adds the word "kitchen" to the list of areas requiring GFCI protection.

19. I have a large 6000 square foot home and it has two furnaces, one up-draft and the other a down draft for the lower level area and is located next to each other.

The HVAC contractor put both units on the same circuit, and my electrician says that they can not do that; who is correct?

Answer: The electrician, NEC 422.12 and Art. 100

422.12 indicates central heating equipment is required to be supplied by an individual branch circuit. Art. 100 definitions, indicates an individual branch circuit is that which supplies only one utilization equipment.

20. As a Certified UDC Electrical Inspector and having a number of Towns and Villages that I work in and crossing Co-op and other Utility service area's; I have different requirements when contacting power companies for service hook ups or re-connections. Some allow a phone in response (OK) and then a follow up written approval forms and other will not do anything until such time as they have the written form in their possession. Can you provide guidance?

    Answer: The answer lies in SPS 316.940(2)(d)(3) and SPS 316.950(1)

    To follow the exact wording a recordable written document is required by SPS 316.940(2),(d)(3) and 316.950(1). But as an operating protocol many power companies may allow a call in with follow up written proof provided. This varies around the state and you need to work it out for your area. As has been said that the job is not done until the paper work is done applies. Normally a 24 hour period would be acceptable so get it done.

21. I have a contractor in a single family dwelling unit, that has installed two receptacles on a # 12/3 AWG, NM-B 20 ampere branch circuit in a bathroom adjacent to the sink. It then continues on to other bathroom areas and she has also installed an additional (6) receptacles on a # 14/3 AWG., NM-B, 15 ampere circuit, to that same bathroom. I told her they would all have to be on a 20 ampere circuit. Is that correct and acceptable?

    Answer: Yes, NEC 210.11(C)(3)

    210.11(C)(3) pg. 48 indicates the term "receptacle outlet(s) meaning one or more on that 20 ampere circuit. Some of the confusion lies in the exception for a single circuit to a single bathroom area. It refers you to 210.23 (A) (1) and (A) (2)

pg. 51 for cord and plug equipment and fastened in place equipment and no mention of 210.23 (A) which leads one to believe that a 15 or 20 ampere additional circuit could work.

22. I am wiring my sister-in-laws new home, she wants everything and does not want to pay for much of it. In her last copy of Better Homes and Gardens, she saw a kitchen layout with marble counter tops and an 18" inch marble backsplash and no visible receptacles for the counter top area. She says she wants a 4" valance on the bottom side of the upper cabinets and I can put them facing down, to cover the area. I told her I could not do it that way correct.

    Answer: No, NEC 210.52(C)

    I FEEL YOUR PAIN, but per 210.52 (C) (5) pg. 54, it would meet the code requirement if not more than 20" above the counter top.

23. Per the question above, with the boxes and receptacles facing down, would you be able to run, exposed # 14 AWG NM-B W/G, cable since they would not be wall receptacles? Also for those circuits installed in that manner and location, would I have to use a raceway, MC, or AC cable?

    Answer: No, Check with AHJ, NEC 210.11(C)(1), 210.52(B)(1), and 334.15

    First of all those circuits require a 20 ampere circuit, per 210.11(C)(1) page 48, and 210.52 (B) (1) pg. 52, as well as 210.52 (C) , which is in the answer above. Next per 334.15 (A), pg. 186, for exposed work with the comment that they must closely follow the surface or put up running boards. Also in (B) the concern is for physical damage issue that would be an AHJ call. The MC or AC cable would address those problems. Should she still want the NM-B cable, when you are done, take a picture of it for the magazine to use.

24. In a 1910 two story home, we had a bedroom ceiling light fixture burn out and when by brother-in-law, (he knows about electricity and has friends who also do at the big box store); as he took it down there were only two wires with burnt ends on them, of the Knob and Tube type, coming out of the hole in the plaster and lath; also a lot of ground up cellulose insulation fell down as well. He said

we may have a problem. I need the light and want to install a fan as well. What can I do?

Answer: Need to install a new branch circuit, NEC 394.12(5), 410.42(A), and 250.110(1)

Per 394.12, (5) pg.236, you can not just put in a plastic box and walk away from the problem. Knob and tube cannot be concealed in hollow spaces of walls, ceilings, or attics that are insulated such that the conductors are in contact with the insulation. Also look at 410.42(A) which requires exposed metal parts of luminaires to be connected to an equipment grounding conductor and 250.110(1) requires non-current carrying metal parts located less than 8' high and subject to contact of persons to be grounded. It would be best to get a competent qualified electrician and have a new branch circuit installed.

25. I like my UDC electrical inspector and she seems to know what she is talking about most of the time; but I installed an over head 60 ampere, (4 wire # 6 Quadraplex aluminum circuit from the house to the outbuilding that serves as the husbands, smoking, drinking and loud music meeting hall for his rowdy friends and she said the cable is to low. The owner has AVON delivery trucks pass underneath them so I put them up 15.' Ft. and she said it should be 18'. Can you clear her up on this issue?

    Answer: You need 18', NEC 225.18

    First of all see 225.18 (4) pg. 69, it should be 18'ft. of clearance. Typically 15' would be sufficient for a dwelling however (4) indicates that where you have areas subject to truck traffic 18' is required. The Avon delivery truck would require the 18'.

26. In a new home with a 200 ampere single phase 120/240 volt service, the owner wants to have a separate 200 ampere service run to his attached garage. He wants to keep track of the cost of his wife's bedding plants and organic lettuce growing operation that she sells to the public in spring and then to restaurants year round. Can I do that?

    Answer: No, NEC 230.2

230.2 allows only 1 service on a structure unless you meet one of the special conditions in (A), (B), (C), or (D) which you do not meet. You could install a second meter supplied from the same service. The disconnects would be required to be grouped per 230.71.

27. I installed liquid-tight flexible conduit to an air conditioning unit at a new home we were wiring. The inspector red tagged the job because the liquid-tight was not listed. I contend if the distributor can sell it to me it should be OK. What do you think?

    Answer: The inspector is correct, NEC 350.6

    350.6 requires LFMC and it's fittings to be listed. Similar requirements are found in all of the raceway articles. They can sell what ever they want.

28. The inspector is requiring me to AFCI protect the receptacles in the dinette. I contend that it is part of the kitchen and 210.12 does not list the kitchen as a room where the branch circuits are required to be AFCI protected. What do you think?

    Answer: If part of kitchen it does not require AFCI protection, NEC 210.12

    I consider a dinette as being part of the kitchen. There may be a cabinet or peninsula dividing it from the rest of the room however it is part of the room. In that case it would not require the protection. A dining room is listed in 210.12 and I consider that as being a separate room, perhaps divided by a wall. Look at the plan and how the area in question is designated. Remember if the circuit for the lighting is also supplying lights in a room that does require AFCI protection they would be required to have AFCI protection as well, or if the receptacle circuit also supplied receptacles in a dining room they would be AFCI protected.

29. The home we are presently wiring has a wrap-around deck with a door coming from the master bedroom on the back wall and a door from the kitchen on the side wall near the rear of the house. I know I need to install a receptacle at the front and back of the house. The owner would like one near the door coming

from the kitchen. Do you think I will need to install another on the back wall?

Answer: No, NEC 210.52(E)(1)

You are correct you are required to install an outdoor receptacle at the front and back of the dwelling by 210.52(E)(1). If the receptacle you install on the side of the house is within the back ½ of the dwelling it would be considered to be meet this requirement. Remember though the receptacle is required to be accessible while standing at grade level and a porch may not be at grade level.

30. The inspector wrote me up for not having a disconnect within sight of the dishwasher. I explained to her that I installed a breaker lock on the branch circuit supplying the dishwasher but she said that was not good enough. What do you think?

    Answer: She is correct, NEC 422.32 and Art. 430 Part IX

    While 422.31 (B) indicates when you have an appliance rated more then 300 VA or 1/8 HP you can install a lock on the branch circuit breaker supplying the appliance 422.32 indicates a motor operated appliance is required to have a disconnect located within sight of the dishwasher that complies with Part IX of Art. 430. We consider a dishwasher to be a motor operated appliance and you would have to follow 422.32. These code sections have caused some confusion over the years as to which section to use however a change in the 2011 NEC will help remove the confusion. Now 422.31 (B) addresses only appliances over 300 VA and a new 422.31(C) addresses appliances with a motor over 1/8 HP.

31. On a recent hot tub installation I was informed by the local inspector that an outlet I installed was in violation of 680.22 (A) (3) & (B), in short the connivance outlet. He claims the outlet is within the 6 foot rule and I claim there is an "effective permanent barrier".

    In the attached pictures you can see that the customer constructed a permanent three sided structure that contains the new hot tub. The structure in constructed of solid lumber and the upper sides have lattice. The inspector is claiming that since there is lattice in the structure, it is an "unacceptable" material to be used as a barrier. He has failed to give me any building or electrical code reference

for this claim.

I have argued that the structure as a whole is an "effective permanent barrier" as indicated in the code article and that when 680.22 (A) (5) is applied the outlet is code compliant. What is your opinion?

Answer: The inspector is correct, NEC 680.22(A)(5)

A very interesting question! The answer is found by applying NEC 680.22(A)(5). This section indicates, "the distance to be measured shall be the shortest path the supply cord of an appliance connected to the receptacle without piercing a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective barrier." So the effectiveness of the barrier is the inability to route a cord through it.

Based upon your pictures, the vertical wood siding appears to meet this test. The lattice does not. So if you measure from the inside wall of the tub, through the lattice and then down to the receptacle, the distance must be at least 6-feet in order to meet 680.22(A)(2). The "barrier" could also be modified in order to meet this requirement.

32. We installed a breaker lock on the circuit breaker protecting the branch circuit for the well. The circuit breaker panel was located within sight of the pressure switch until they finished a small play room in the basement and it ended up in this room with the pressure system in the furnace room. The inspector now wants us to install a disconnect in the furnace room. Is this correct? Also what will the licensing requirements do to well installers after April 1, 2013?

    Answer: Yes, NEC 430.102(A)

    430.102(A) requires an individual disconnecting means be installed within sight of a motor controller. The pressure switch would be considered the motor controller and because the circuit breaker panel is no longer within sight of the pressure switch you would need to install another switch. Also 430.109(B) requires a disconnect within sight of a motor. The exception allows where it is impracticable to install within sight, the controller disconnect is allowed to act for the motor where it is lockable. The well installer will be able to install the circuit from the pump to the last disconnect, junction, pull, or device box which is nearest the pump. This could be the pressure switch.

33. I have a customer that wants a generator and automatic transfer switch for her house. The service on the house has a 200-amp pedestal with a 200-amp main. The calculated load for the house is 124-amps. I was thinking of using a 30kW generator with 150-amp transfer switch. Is this OK?

    Answer: Yes, NEC 702.5(B)

    The first requirement is to ensure that the standby source is capable of supplying the full load intended to be automatically transferred. If the whole house is being transferred, then either a load calculation, demand measurement, or other method acceptable to the AHJ must be used to determine the total load. You indicated the calculated demand load is 124-amperes. The generator can be loaded to 125-amperes. So this arrangement is acceptable be will not leave any room for future loads. Remember that 702.8(A) requires a sign be placed at the service equipment. The sign shall indicate the type and location of the stand-by source.

34. I recently failed an inspection because I had 3 Homeline breakers in a Siemens panel. The breakers snapped in place and fit snug to the buss bar. Is there a code article that explains this? In my 20 years I have never been called on that. I know if the breakers don't fit in place that would not be feasible. What are your thoughts?

    Answer: Yes, SPS 316.110

    The question is how is the panelboard and breakers listed. Comm.16.110 indicates listed and labeled equipment shall be installed in accordance with the listing and manufacturers' instructions. The 2011 UL White Book page 100 product category DIXF indicates some breakers are Classified for use in specified panelboards. They have specific installation requirements such as available fault currents less then 10,000 amps of available fault. This would limit them to being installed on services with less the 10K AFC. They come with marking on them indicating what publication to refer to for the panelboards they are allowed to be installed in. Manufacturers of panelboards indicate what breakers they allow to be installed, and of course they will only list their breakers.

I have heard that some will not warranty their panel without their breakers installed however I don't feel that is a code issue.

35. I installed 2-200 ampere 120/240 volt panelboards from a 400 ampere service. We installed a #4 AWG copper grounding electrode conductor from the intersystem bonding terminal strip to our ground rods. We also installed a #4 AWG conductor from each panel to the terminal strip. The inspector failed us indicating we needed a continuous grounding electrode conductor from the rods to each panel. I think we can do it the way we did but can't find a code section to allow it. Can you help me?

    Answer: Yes, NEC 250.64(D)

    The grounding electrode can be terminated at a grounding bar for the installation you are referring to.

    When installing a service with multiple disconnects as allowed by 230.71(A), which is what your installation is, I would look at 250.64(D).

    (1) tells us we can use a common grounding electrode conductor with taps from each switch. Size the main grounding electrode conductor using Table 250.66. A tap is then installed to the grounded terminal in each switch sized to the largest conductor supplying the switch. Finally the common grounding electrode conductor must not have a splice. I would accept the intersystem terminal required by 250.94 if the required 3 terminations are still available for the other systems.

    This would seem to be the installation you have. The tap conductors to each panel and the ground rods could be a #4 AWG copper. The conductor to a metal water pipe however would have to be a minimum #2 AWG copper. A 2/0 conductor is 133100 kcmil. So assuming a set of 2/0 cu to each panel, 133100 X 2 = 266200 kcmil. Table 250.66 requires a #2 AWG for service conductors over 3/0 through 350 copper. If using aluminum service conductors add the largest to each panel and the same would apply. This would apply whether the water pipe is a grounding electrode 250.52, or if we are just bonding the metal water pipe as required by 250.104.

    (2) allows an individual conductor from each panel to the grounding electrode or bonding of water piping sized to the service conductor to each panel. In this case

size each using Table 250.66 for the largest service conductor supplying the panel.

(3) allows the grounding electrode to be connected to the grounded conductor at a common location such metering equipment or a wireway. Many utilities do not allow a connection in the metering equipment so check with them first if using this provision.

36. I own a landscape company and on a recent project we installed 24 volt "landscape" lighting in the gardens near a new in-ground pool. The power supply is plugged into a GFCI receptacle we installed in the garden. The inspector says we also need GFCI protection on the load side of the power supply for the lights. We never have this problem when we install this lighting in other gardens so what is his problem?

    Answer: They may be to close to the pool, NEC 680.22(C)(1) & (4)

    Luminaires cannot be located over a pool or within 5' of the inside wall of a pool unless they are located at least 12' above the maximum water level by 680.22(C)(1). Also 680.22(C)(4) requires GFCI protection for any luminaires installed between 5' and 10' feet horizontally from the inside walls of the pool to be GFCI protected unless located more than 5' above the maximum water level and attached to the structure adjacent to the pool. It makes no difference what the voltage is.

37. When the upper end of a service panel riser conduit which is less than 2 feet in length is sealed does the current-carrying capacity of the conductors need to be reduced? I thought that the adjustment was only called for when a passage through a top or bottom plate was sealed.

    Answer: No, Not quite correct, SPS 316.310(1) & (2), NEC 310.15(B)(2)(1), NEC 312.5(C) Exception, and SPS 316.312(1), (2), and (3).

    The general requirement in SPS 316.310 adds an exc. to 310.15(B)(2)(a) that does not require derating for branch circuits serving residential occupancies. However a new requirement, introduced in the 2008 NEC, requires derating where two or more Non-Metallic cables installed, without spacing, through the

same openings in wood framing. It only applies if the opening is to be fire or draft-stopped with thermal insulation, caulk, or sealing foam. The requirement does apply to nonmetallic cables such as Types NM and SE. See question 40 for example.

38. We have adopted the UDC requirements for existing old homes. They are replacing knob and tube upstairs and running new circuits. I thought that modifying the circuit kicked in the requirements for AFCI but the Q&A section from your website seems to say it would not be needed. Could you please clarify for me?

    Answer: You are correct, SPS 316.003(3)

    If they are installing a new branch circuit, from the circuit breaker panel or fuse box, to an area that would be required to have AFCI protection the new circuit would be required to have AFCI protection installed. SPS 316.003-(3) indicates existing installations shall conform to the code that applied when it was installed. If the existing circuit did not require AFCI protection when it was installed you would not be required to protect it now. The same applies to tamper-resistant receptacles.

39. In reference to the conversations we've had with the state, it is our understanding that hard wiring the condensate pumps to the accessory terminal of the furnace is an acceptable method and hopefully being added to the code changes you are currently recommending. We have attached a scanned copy of the manufacturer's book showing the wiring recommendations when the cord plug end is not being used. Please confirm that this is OK.

    Answer: OK, If permitted by the manufacturer’s instructions, SPS 316.003(3), 422.12 Exc. 1

    Condensate pumps may be connected directly to the accessory terminals of the heating appliance. This type of connection must be in keeping with the installation instructions for the heating appliance. The connection from the pump to the terminal must be with a Chapter 3 wiring method unless the AHJ determines that NEC 400.7(A)(7) applies. This section permits a cord to be used without attachment plug if prevention of the transmission of vibration is required.

This is reasonable for a typical pump connected to a typical furnace. 422.12 Exc. 1 allows auxiliary equipment associated with the furnace to be connected to the same branch circuit.

40. How many NM cables can you run horizontally through holes with fiberglass insulation in stud cavities. Do the derating factors apply? And also in a drop ceiling can Romex be exposed?

    Answer: Yes and Yes, SPS 316.310-(1), NEC Table 310.15(B)(2), NEC 334.15, and SPS 316.334(1)

    There is no limit to the number of cables. Derating or as the code calls it "ampacity adjustment" for this requirement starts with the third cable. The rules are also found in 334.80. Example 8-#12 AWG conductors. Table 310.16 indicates 30 amperes for #12 for derating purposes. 30X.7=21 amperes, OK. The practical limit turns out to be a maximum of 4 cables. The requirement for derating also applies for NM cables run through a wood framing member that will be fire or draft stopped using caulk, insulation, or sealing foam.

    Exposed NM must follow the rules in NEC 334.15. Perhaps you are thinking of 334.12(A)(2)? The prohibition on using NM above drop or suspended ceilings in commercial buildings does not apply in Wisconsin. This section of the NEC is deleted by SPS 316.334(1).

41. If I install a 30A twist-lock-type receptacle in a box adjacent to a sump, would it be code compliant if I made a pigtail with a 30A cord cap to a 14 AWG cord in order to avoid putting a sump pump on a GFCI. If not, are there any other options?

    Answer: Yes, there are other options. SPS 316.210(2)(b)Exception

    This exception allows no GFCI protection for a single receptacle providing power to a sump or sewage pump where an accessible GFCI protected receptacle is located within 3-feet of the non-GFCI protected device.

42. I have a quick question on duplex service risers. It seems to me I would have to do a load calculation if I use service conductors under #3/0 copper for 2-100 amp panels. Could I also use dual 100 amp meters if lugs are rated for #3/0 or would I have to use a dual 200 amp meter socket?

    Answer: You need minimum 100 amp per socket and 200 amp buss, NEC Table 310.15(B)(2)(6) and 230.42(A)

    The inspector should require a load calculation if the conductors are less then 3/0. The service conductors common to both dwelling units must be calculated and sized per the load. Same answer for the meter socket. For example, say the result of the load calc was 150-amperes. The common power buss of the socket would also have to have a minimum 150-ampere rating.

43. I relocated a dwelling service, I'm extending but reconnecting the existing branch circuits as they were originally connected, am I required to install 2-pole breakers on multi-wire circuits and AFCI breakers for applicable parts of the house?

    Answer: No, SPS 316.003(3)

    According to the WI State Electrical Code this is considered a repair. Any existing branch circuit or multiwire branch circuit is permitted to be reconnected in a similar legal fashion without the requirement of installing AFCI protection and without having to install handle ties on single pole circuit breakers installed for the existing multiwire circuits.

44. Bathroom circuits are not required to be AFCI protected. Am I permitted to have the bathroom vanity light and exhaust fan connected to the adjacent bedroom AFCI protected circuit?

    Answer: Yes, NEC 210.12(B)

    Although NEC 210.12(B) does not mandate AFCI protection for the bathroom it does not prohibit the installation of AFCI protection for that area in whole or in part. The code is a minimum which allows the installer to exceed the minimum protection requirements when desired. The same provision applies to other

areas of the house where AFCI protected circuits may extend into areas which the code does not mandate AFCI protection.

45. I moved a dwelling service from one end of the house to the other converting the old cabinet into a junction box. I installed a 1 ¼" EMT raceway from the new service across the basement to the old cabinet and pulled all 20 circuits through it for reconnection. The inspector says I can only have 8 conductors in the raceway. Where did they come up with a maximum 8 conductors?

    Answer: Conductor Ampacity adjustment factor NEC 310.15(B)(2)(a) and SPS 316.310 Exception No. 6

    The inspector is attempting to point out that installers must adjust conductor ampacities for raceway fill as indicated in Table 310.15(B)(2)(a). Typically once a raceway contains more than 3-current carrying conductors the conductor ampacities must be adjusted. Heat given off from the conductors will degrade the conductor ampacities. For adjustment purposes the code tells us to use the lowest conductor temperature ampacity in the raceway as the starting point for adjustment. Per Table 310.16, a #14 THHN conductor is capable of carrying 25 amperes prior to adjustment. For 8 current carrying conductors the adjustment value is 70% so, 25A X 70% = 17.5A current carrying capacity which permits us to use the conductor as intended for a 15 ampere circuit and protect it at the required 15 amperes. On the other hand if there were 10 current carrying conductors the adjustment factor is 50% so, 25A X 50% = 12.5A. Now you would have to re-evaluate your circuit for a max. 12.5A of calculated circuit load.

    Now that you know how to calculate for ampacity adjustment I can explain how the inspector may have been incorrect. SPS 316.310 Ex. #6 says that the derating factors shown in NEC T310.15(B)(2)(a) does not apply to branch circuits which supply an individual dwelling unit. The installer could have installed any number of current carrying branch circuit conductors and not have to make any ampacity adjustments. However, if 2 or more of the conductors were feeder conductors Exception #6 would not apply.

46. A house is supplied with a 100A 4-wire 1-phase feeder from a free standing service located 25' from the house. Is the house panelboard required to have a main disconnect? What if the panelboard is located 12' inside the basement?

Answer: Yes, You will need a disconnect nearest the point of conductor entrance NEC 225.32 and SPS 316.225(4)

Although the house is being supplied with a feeder NEC 225.36 requires a service rated disconnecting means and the location of that disconnecting means per 225.32 (similar to the 230.70 service disconnect location) shall be located at a readily accessible location nearest the point of entry of conductors either inside or outside of the building served. SPS 316.225(4) refers to SPS 316.230(3) which allows the feeder raceway or cable to enter the building up to 8' to the disconnect enclosure but only where obstructions prevent locating the disconnecting means at the point of conductors entry. For the typical 4-circuit or more panelboard to be Listed as "Suitable for use as service equipment" it must contain a "main" disconnecting means.

Where the panelboard will not be at the point of entry and can't be located within the 8' allowed for obstructions, a service rated disconnect is still required to be located to comply with 225.32 which then supplies the remote panelboard. Since this is a feeder supplying the house (which already has overcurrent protection for the feeder conductors at the supply end) duplicate overcurrent protection for this feeder is not required at the house. The required service rated disconnect could be a non-fusible disconnect or a disconnect of higher value than the feeder (such as a 200A circuit breaker). With this separate building disconnect installed per code the interior panelboard supplied from it is not required to have a main breaker within it.

47. A house supplies the detached garage with a 60A 120/240V underground USE feeder. There is a #4 equipment grounding conductor installed with the feeder. Do they still need to install ground rods for the garage panel?

    Answer: Yes, NEC 250.32(A) and (B)

    This garage is a building supplied by a feeder from a different building thus the feeder conductors must terminate in a service rated disconnect at the garage. From this disconnect 250.32(B) requires the bonding of the feeder equipment ground (and equipment supplied) to the grounding electrode system which consists of an electrode conductor sized per 250.66 and the electrode/s present. Per 250.32(A) where none of the electrodes listed in 250.52 are present, the installation of rod electrodes complies with the code.

48. The house service is connected to a concrete encased electrode. The underground water supply enters the house as plastic pipe. The inspector insists that I ground the inside copper water piping. I explained that it wasn't required since it wasn't an electrode but the inspector insists I ground it. Help!

    Answer: Interior metal water piping shall be bonded, NEC 250.104(A)(1) & (3)

    If the house is supplied with a service 250.104(A)(1) requires the metal water piping system to be bonded to the grounded (neutral) service conductor and electrode system. If the house is supplied by a feeder 250.104(A)(3) requires the metal water piping system to be bonded to the feeder equipment ground and electrode system. The size of the bonding conductor for each is based on the size of the supply conductors and Table 250.66. Although the metallic water piping is not an electrode (as described in 250.52(A)(1), it is still required to be bonded with a bonding conductor sized in the same manner as an electrode conductor. The Department does not require bonding of isolated sections (segments separated by nonmetallic water piping) of metallic water piping where the isolated section of metallic water piping is less than 10' in length.

49. An inspector is holding up occupancy until I bond the gas piping with #6 to the service panel. It is threaded black gas pipe but they insist I bond it because someone could install CSST in the future. The inspector is making the general and owner think this is an electrical violation what can I do?

    Answer: Request the violation order in writing and submit it along with contact information to the State Building or Electrical Inspector for assistance, SPS 323.16(2)

    The requirement to bond gas piping in the electrical code is found in 250.104(B) "Other Metal Piping". This section requires metal piping other than metallic water piping to be bonded with a conductor which is sized per 250.122. The branch circuit supplying an appliance bonds the appliance with a conductor also sized per 250.122 as required by 250.110 – 250.114. Providing the equipment has a mechanical and electrically conductive path to the metal piping, the metal piping is considered bonded from the branch circuit equipment ground and no further action is required by the electrical code.

Wisconsin does not have a code requirement for the bonding of steel gas piping with the premonition of someone installing CSST type gas piping in the unforeseen future. As part of a class action settlement on March 5, 2007 the manufactures named agreed to include specific bonding requirements as part of their installation instructions (this was never a listing requirement for the products). The installer of the CSST is required by SPS 323.16(2) to install the piping in accordance with the referenced 2006 – NFPA 54.7.2.8 (according to manufacturer's instructions). In the future NFPA 54 incorporates the #6 bonding conductor (when installing CSST is installed) into code text similar to that of the manufacturer's installation instructions. "FlashShield" by Gastite was not part of the class action settlement and does not require addition bonding until the 2009 NFPA 54 is adopted by Wisconsin.

Gastite installation instructions excerpt:

4.10 Electrical Bonding of Gastite®/FlashShield™ CSST
Unlike Gastite®, there are no additional bonding requirements for FlashShield™ imposed by the manufacturer's installation instructions. FlashShield™ is to be bonded in accordance with the National Electrical Code NFPA 70 Article 250.104 in the same manner as the minimum requirements for rigid metal piping. However, installers must always adhere to any local requirements that may conflict with these instructions.

50. A new dwelling is supplied underground from a farm pole top disconnect. Is the UDC inspector required to inspect this supply as part of the dwelling inspection?

    Answer: Yes, SPS 324.01

    The 1 & 2 Family Dwelling electrical inspector is expected to inspect the associated dwelling service and feeder installation.

51. The electrician installed 3-4/0 AL conductors from the pole top disconnect to a 200A fused disconnect mounted on the same pole and continued with 4/0- 4/0-2/0 AL USE to the house panelboard. There is no parallel grounding path from the house and all the water piping is plastic. The state inspector stopped for a farm inspection and ordered the house service corrected. What did I miss?

Answer: Equipment grounding conductors, 250.32(D)(1) & (3) and 547.9(A)&(B) or (C)

The site-Isolating device (pole top) is unique to farm installations only. Although a 1 & 2 Family inspector doesn't have the authority to inspect the portion supplying the farm they do have authority to inspect the portion specifically installed to supply the dwelling. A site-isolating device does not contain overcurrent protection rather it acts like a non-fusible disconnect. The conductors supplied from the site-isolating device are similar to service conductors because they have no overcurrent protection.

You indicate you have installed a 200 ampere fusible disconnect below the site isolator, on the same pole, and then proceed underground to the house. For this installation I would look at 547.9(C) which indicates we need to meet the requirements in 250.32 (D)(3) which requires a separate equipment grounding conductor to be installed with a feeder to a separate building. If an ag building is to be supplied from the house an underground equipment grounding conductor would be required to be an insulated or covered copper conductor.

230.91 indicates the service overcurrent device shall be an integral part of the service disconnect or adjacent to it so, because the site isolator and fusible switch are at the same location, the conductors from the site isolating device to the fusible switch could be installed as service conductors. The grounded conductor would be bonded to the site-isolator and the fusible switch enclosure, a grounding electrode installed, and no equipment grounding conductor would be required between them.

Remember when installing an overhead feeder from the site isolator to a building 547.9(A)(7) indicates no overcurrent protection is required until we get to the building and (B)(3) requires the feeder to be installed to meet 250.32 which would require an equipment grounding conductor be installed with the feeder. Also 547.9(B)(3)(1) requires the equipment grounding conductor to be the same size as the largest supply conductor if of the same material or adjusted in size using Table 250.122 if of different material.

52. I installed a 320A meter pedestal onto the side of a house. One set of lugs supplies an adjacent Ronk transfer switch before supplying the 200A interior house service panel. The other set of lugs supplies the horse barn. The inspector said I needed to change the meter pedestal to one which contains circuit breakers and change the grounding. The owner doesn't want to spend the

additional expense, is it necessary?

Answer: Yes, SPS 316.230(4), NEC 230.70(C), NEC 230.72(A), & NEC 230.91

Where a service supplies multiple buildings or structures SPS 316.230(4) requires the service disconnecting means to be installed at the point where the Utility terminates and the premise wiring begins. Either a single or multiple service disconnects (max. 6) may be installed. The service disconnects are required to be grouped per 230.72(A). The service overcurrent protection must be an integral part of the service disconnect or shall be located adjacent. A service disconnect shall be identified as "suitable for use as service equipment" and although Ronk does make such a switch it does not contain overcurrent protection. The meter pedestal which has the integral panelboard (typically 2-circuit breakers) is most likely the most economical and appealing corrective action however, the code permits a single disconnect with feeder tap requirements if you chose to go that route.

53. Is the inspector correct ordering the installation of an intersystem bonding kit at a feeder supplied detached garage? What if the garage was supplied from a multi-wire branch circuit?

Answer: Only if other systems requiring bonding are present, NEC 250.94

An accessible intersystem bonding termination means shall be provided for the connection of a minimum of 3 system bonding and grounding conductors at the service equipment and at the disconnecting means for any additional buildings or structures. This would include buildings or structures supplied with a feeder or a branch circuit. The "States" interpretation has been that if no other systems requiring bonding are present you would not need to install an intersystem bonding kit. The Exception to 250.94 simply says that the intersystem bonding for existing buildings or structures does not have to include terminals and does not have to be located near the building disconnect.

In the 2011 NEC there is an additional 250.94 Exception which omits the requirement to provide for intersystem bonding at buildings or structures supplied by branch circuits.

54. A feeder raceway enters the house through the box sill with a LB conduit body after passing under 12' of wood deck. The deck joists are located 6" – 12" above the finished grade. The state inspector rejected the installation requiring an access opening in the deck for the conduit body so I asked 2 different municipal inspectors I know if the state inspector was correct and they said there was nothing wrong with the installation. The decking is composite and can't span an access opening. What can I do?

    Answer: Install the raceway in a manner that eliminates the need for conduit bodies, NEC 314.29

    NEC 314.29 requires boxes and conduit bodies to be rendered accessible without the need to remove part of the building. Locating the conduit body where an electrician has to crawl under a deck 12' with only 6" – 12" of ground clearance does not leave the conduit body accessible. Eliminating the need or relocating the conduit body to an accessible location is the solution. As always, SPS 316.005 gives you the right to file a Petition for Variance.

55. Is the one and two family dwelling inspector required to inspect the private well and effluent tank wiring as part of the dwelling inspection?

    Answer: Yes, SPS 324.01

    The 1 & 2 Family Dwelling electrical inspector is expected to inspect the dwelling's associated private well pump, effluent pump, and alarm wiring for compliance with SPS 316.

56. Are finished basement lights required to be AFCI protected?

    Answer: Yes, NEC 210.12(B)

    The key words are "finished basement". A finished basement is called many different names for different uses and most are listed in 210.12(B) thus identifying where AFCI protection is required. When applying the electrical code, finished basement simply means that the area has been provided with the required receptacle outlets per 210.52(A) and the required lighting outlets per 210.70(A)(1). Wall, floor, and ceiling finishes are not used by the electrical code

to determining finished area. With a finished basement, there are more outlets than just lighting outlets that will require AFCI protection.

57. Is an intersystem bonding kit required to be installed when upgrading a dwelling service?

    Answer: Not a kit, NEC 250.94 Exception

    Even when a service or feeder is upgraded/ relocated the intersystem bonding is still required to be done. For existing buildings and structures however, there is no requirement to provide a kit for the termination of 3 system bonding conductors and there is no requirement to provide the point of intersystem bonding at the new disconnect location. You may have to extend a min. # 6 CU bonding conductor from the new disconnect/ electrode location to the location of the previous intersystem bonding location to maintain the bonding.

58. Is the UDC inspector required to inspect the satellite dish installation at a dwelling? If so, where are the requirements in the code?

    Answer: Yes, SPS 324.01 and NEC Article 820 and Article 810

    The 1 & 2 Family Dwelling electrical inspector is expected to inspect the dwelling's associated exterior antenna and system wiring for compliance.

    The metal satellite support is required to be grounded (810.15) in accordance with 810.21. The lead-in coax cable is required to pass through an antenna discharge unit (810.21(A) located outside or inside the nearest practical entrance of the cable (810.20(B) which is also required to be grounded in accordance with 810.21. The antenna and discharge unit are to be bonded with a min. #10 CU to the intersystem bonding or electrode system. The coax lead-in cable is not to be located within 2" of NM cable 810.18(B). The coax is required to be listed (820.113) and marked CATV or as permitted by cable substitutions (820.154).

59. The owner constructed a wet bar with a dishwasher, disposal, refrigerator, and space saver microwave in their basement. The inspector is calling it a second kitchen and I say it isn't. I wired it with (2) 20A AFCI branch circuits along with

GFCI protection on the receptacles located within 6' of the sink incl. the disposal. The inspector said all countertop receptacles must be GFCI protected but no AFCI protection is required. Who is correct?

Answer: The electrical contractor is correct, NEC 100 Def. Kitchen, NEC 210.8(A)(6) and (7), SPS 316.210(1), and NEC 210.12(B)

By definition this is not a kitchen. A microwave is not considered a permanent cooking appliance. Being finished basement area instead of a kitchen, 210.12(B) requires all 120V 15A & 20A outlets to be AFCI protected. Any 125V 15A or 20A receptacle located within 6' of the bar sink shall be GFCI protected per SPS 316.210(1) including any located above, below, or within the cabinets if within 6' of the sink. Receptacles located beyond 6' of the sink are not required to be GFCI protected.

60. Is it permissible to wire a furnace with cord and cap from a receptacle? How about a 40- gallon water heater?

    Answer: No and No, NEC 422.16(A)

    Flexible cords are permitted to connect appliances where permitted by 422.16(A) for frequent interchange, prevention of the transmission of noise, or for easy removal of appliances that are specifically designed to permit ready removal for the purpose of maintenance and repair to include the requirement for the appliance to be identified for cord connection. Furnaces and storage type water heaters do not fit the need for the using cord as required by 422.16(A), they are not individually identified for use with cord in 422.16(B), and I have not seen either with cord indicated as a supply method. The only way to legally use cord for these appliances would be to use 422.18 which according to SPS 316.100(2)(b) means a petition for variance from the department

61. A 15A branch circuit supplies 500 square feet of dwelling floor space which includes 2 bedrooms, hallway, and bathroom lighting. This is less than the permitted 3 watts per square feet but the inspector wants the circuit load split. The circuit supplies the area receptacles, 2 paddle fans with 5- lamps each, a 6 lamp vanity luminaire, and a combination bath fan. They will never turn everything on at once, isn't the 3 watts per square foot all we need to be

concerned with?
Answer: No, NEC 210.11, NEC 210.23, and NEC 220.10

The branch circuits required to be installed shall be calculated and designed to comply with 220.10. These branch circuits shall not be used to supply load that exceeds the rating of the branch circuit per 210.23. Where there are known connected loads such as permanent wired luminaires and equipment the installer is required to provide a branch circuit capable of supplying those known connected loads.

62. A house has a 200A pedestal with a main circuit breaker supplying an interior 200A panelboard. The water supply is plastic but the interior piping is copper. The ground rods come out of the meter pedestal but, my question is, can I bond the interior piping from the interior panelboard? If so, what size conductor is required a #6 CU or a #4 CU?

    Answer: No, # 4 CU, NEC 250.104(A)(1)

    To clarify, this is not metal underground water pipe. Bonding of metal water piping per 250.104(A)(1) requires connection of the bonding conductor to the service equipment enclosure, the grounded service conductor (neutral) at the service, the grounding electrode conductor where properly sized, or to the one or more system grounding electrodes used. The bonding conductor is sized from T250.66 based on the size of the ungrounded service conductors.

63. The house uses one 15A branch circuit to supply the interior and exterior garage lights (360 watts), 5 interior and exterior garage 15A duplex convenience receptacles, and two ½ HP overhead garage door openers. How do I calculate this to confirm compliance?

    Answer: NEC 210.11, NEC 210.23, NEC 220.10, NEC 220.14(C), NEC 422.62(A), NEC 430.24, and NEC T430.248

    Since the door openers are on the same branch circuit as other loads 422.62(A) says to use 430.110(C)(1) and T430.248 to find the FLA of the appliance motor HP marking. A 120V ½ HP motor is 9.8A x 2 = 19.6A plus (360W divided by 120V) 3A plus known load intended to be plugged into the 5 convenience

receptacles. As you can see so far, the known load is 22.6A. Now read 210.23(A)(2) which says the door opener loads shall not exceed 50% of the branch circuit rating where lighting load and convenience receptacles share the circuit. A single 15A branch circuit is not compliant for supplying these loads.

64. Is GFCI or GFP protection required for a residential marina boat hoist?

    Answer: GFCI protection is required, NEC 210.8(B)(4) and NEC 555.19(B)(1)

    The question states marina not boathouse. These hoists are typically connected with cord, cord cap, and receptacle and because this is located outside the receptacle is required to be GFCI protected. If the unit was wired with raceway GFCI protection would not be required.

65. When will municipal electrical contractor licensing end and the state licensing take over? What needs to be done at the municipal level when this occurs?

    Answer: April 1, 2013. If the municipality intends to keep their present rules intact they will need to change their electrical contractor licensing requirements into who is eligible to be issued a permit type requirement.

66. Our local ordinance doesn't allow homeowners to perform their own wiring and I hear that the new state law will permit the owner of a single family dwelling to perform wiring. How will this affect our local ordinance?

    Answer: The State law only applies to State licensing requirements for electricians. The municipality may by ordinance still control who may obtain a building permit and for what purpose.

67. I replaced a 60A main, range, and 4 fuse service panelboard with a 20-space circuit breaker panelboard and 60A main breaker. The inspector rejected it and is requiring it to be installed as a complete 100A service. I calculated the load at 45A and feel I am permitted to do this. Am I wrong?

Answer: No, SPS 316.003(4)

You are correct assuming your load calculations are accurate. You need to provide the local inspector a copy of your calculations for review and documentation that 60A is adequate. What you have done is a repair to the existing service according to SPS 316.003(4). If you had completely removed and replaced the entire service you would then have to install a minimum 100A service per NEC 230.79(C).

68. A service is moved in a house and the existing service is now supplied as a new 4-wire feeder. What must be done with the electric range, electric dryer, or existing feeder panelboard wiring?

    Answer: Separation between the grounded (neutral) conductor and equipment grounding is required, NEC 250.142(B)

    Since these items are now supplied from a 4-wire feeder rather than a service the grounded (neutral) conductor is no longer allowed to ground the appliances. Feeders were never permitted to be grounded using the grounded (neutral) conductor. The electric range, electric clothes dryer, associated receptacles, and feeder panelboards are required to be wired as a 4-conductor circuit and neutral bonding jumpers shall be removed within the range, clothes dryer, and panelboard. The electrician is required to verify by testing the appliance circuit for cross connection between the neutral and the equipment grounding conductor per NEC 110.7.

69. Is it permissible to remove a kitchen range hood, run the existing 14-2 cable into a 15A receptacle outlet located in the cabinet above the range, then install a space saver microwave plugged into that 15A lighting branch circuit?

    Answer: No, SPS 316.110(1) and NEC 210.11(C)(1)

    Most space saver microwave manufacturer instructions require the appliance to be served by an individual branch circuit. Dwelling unit small appliance circuits are required to be supplied from a min. 20A branch circuit per 210.11(C)(1). Typically a new small appliance branch circuit is installed to a receptacle outlet box located in the cabinet above the microwave and the old 15A lighting branch

circuit conductors are capped/ insulated within the same box.

70. Is NM cable permitted to lay across the top cords perpendicular to exposed trusses in the garage or are running boards required?

    Answer: Running boards are required, NEC 334.15(A)

    NEC 334.15 applies to exposed NM cables. An attic space is not present unless a ceiling has been installed. NEC 334.15(A) "Exposed cables shall closely follow the surface of the building finish or of running boards." NEC 334.15(B) requires exposed NM cables to be protected from physical damage. Where installed within an accessible attic 334.23 applies.

71. Does the code permit me to supply a manufactured home with a 200A panelboard from a 100A feeder?

    Answer: Yes typically, SPS 316.110(1) and NEC 550.33(B)

    It has been reported to us that inspectors have seen homes where the manufacturer's instructions specifically require the 200A supply for the home. If that is the case a 200A feeder is required.

    The homes that do not have a manufacturer's specified supply requirement use NEC 550.33(B) which says; the feeder conductors shall have an capacity not less than the loads supplied, shall be rated not less than 100A, and shall be permitted to be sized per 310.15(B)(6). Calculations are required to substantiate the reduction of the feeder capacity to 100A.

72. Are manufactured home panelboards required to connect to electrodes at the home? Is an intersystem bonding kit required at manufactured homes?

    Answer: No and Yes, NEC 90.3, NEC 250.32, and NEC 250.94

    NEC Article 550 does not modify the electrode requirements for outside feeders required by 250.32. NEC 550.32(A) requires the home service disconnect to be located within 30' of the home or where the service is located more than 30'

away a feeder disconnect marked “suitable for use as service equipment” shall be installed within 30 of the home. The home is treated like a piece of equipment thus the electrode system is required to be installed from the service disconnect or feeder disconnect that is located within 30’ of the home. This disconnect is required to be installed in addition to the panelboard installed by the home manufacturer.

Similar to the electrode system, the provision for intersystem bonding termination is required to be installed at the service or feeder disconnect location where it can be bonded to the electrode system.

73. The Electric Cooperative installed a 200 ampere free standing meter pedestal at the property line with a single ground rod. The pedestal contains two 200A 10,000 AIC circuit breakers to supply the property. The customer’s electrician will be installing the two triplex USE feeders (1- basement & 1-garage for electric heat). Who is responsible for applying the arc flash hazard warning label, the second ground rod, and appropriate short circuit marking?

    Answer: It depends on who owns the equipment, SPS 316.002(2)(d), NEC 110.16, SPS 316.250(1), NEC 250.32

    If the Utility sells the equipment to the customer the Utility (installer) is responsible for complying with the State Electrical Code. If the Utility retains ownership of the equipment the electrician must bring the installation into compliance with code when they make connection (to include the arc flash warning label, augmenting the first ground rod, and any additional noncompliant items found. There is also a problem with the feeder design mentioned. NEC 250.32 requires an equipment grounding conductor be installed with each feeder supplying the building.

74. I installed a 320A free standing service pedestal containing a 200A breaker for the farm and a 100A breaker for the house. The inspector says I need 22,000 short circuit rated equipment and an arc-flash hazard warning label on the equipment. Are these actually code requirements? Do these requirements change if I had installed the service on the house?

    Answer: Yes and Yes, NEC 110.16 and NEC 110.9

A meter socket enclosure installed in/ on the dwelling is not required to have an arc flash hazard warning label per 110.16 however, all meter sockets located elsewhere are required to have the label applied.

You must obtain the short circuit rating at the service point from the supplying Utility before you can safely choose the proper service equipment. Many Utilities require a minimum 22,000 short circuit rating when less than 25' of the Utility supply conductors are installed. In most residential neighborhoods the Utilities typically guarantee not more than 10,000 short circuit rating but, this is a farm so you must find out what the available fault current is.

75. Please help settle a discussion we are having in the shop. We agree when we have a concrete encased electrode installed in the footing we are required to use it as a grounding electrode. The disagreement is whether it is required to be supplemented by another grounding electrode such as ground rods.

    Answer: Does not need to be supplemented, NEC 250.52(A)(3) and 250.53(D)(2)

    You are correct if a concrete encased electrode is present it is required to be used by 250.52(A)(3). The requirement for installing a supplemental electrode is found in 250.53(D)(2) and indicates only a metal underground water pipe is required to be supplemented by another electrode.

76. A dwelling has a 200A panel in the basement with a 200A service disconnect. The PV electrical contractor mounted a 100A meter enclosure and service rated disconnect on the exterior of the dwelling next to the existing 200A UG pedestal. A 1" EMT raceway with #3 conductors connects the pedestal and 100A meter enclosure. The PV contractor states that WE-Energies requires the PV disconnect located next to the pedestal. I think all service disconnects are required to be grouped. What do you think?

    Answer: The PV disconnect is not required to be grouped, NEC 230.40 Exc. # 2 and NEC 230.82(6)

PV systems are permitted to be connected ahead of the service disconnecting means by 230.82(5) or 230.82(6). This permission is found in 230.40 Exception No 5 and does not require a PV disconnect to be grouped with the house service disconnect. The grouping requirement found in 230.40 Exception No 2 would allow up to 6- PV supply disconnects grouped at the same location similar to that of 6 grouped service disconnects.

77. We have a detached garage being fed from a feeder from the house. The feeder is 40 amps (#8's), 4-wire and is protected with a 40 amp circuit breaker. The garage loads are less than 40 amps. 225.39 (D) appears to require the disconnecting means at the garage to be at least 60 amps. Does that also mean (or imply) that the feeder be at least 60 amps as well? Can the 40 amp feeder feed a 60 main circuit breaker panelboard at the new building?

    Answer: No and Yes, NEC 225.39(D), 225.5, 220.10, and 408.36

    I agree 225.39 requires the disconnecting means to be not less the calculated load and in no case less then (A) thru (D). NEC 225.5 indicates the size of the conductors shall be based on loads as determined by 220.10 and Part III of Art. 220.

    While the code permits the feeder conductors supplying the garage to be less than 60- amperes, 225.39(D) requires these conductors to terminate in a minimum 60-ampere service rated disconnect at the garage. The described installation sounds compliant with the 60- ampere main breaker panelboard. NEC 408.36(D) required back-fed breakers to be secured to the panelboard.

78. We have been told that it is acceptable to add a receptacle with a GFCI device on the outside of a house where it is fed from the separate dining room receptacle circuit. Is this true? My competitor says they do it all the time.

    Answer: No, NEC 210.52

    The dining room receptacles must be supplied from the two or more small-appliance branch circuits required in Section 210.52 and Section 210.52 (B) (2) says "The two or more small-appliance branch circuits shall have no other outlets." The only exceptions are for an electric clock in the rooms served as well

as outlets used to supply the ignition circuit on gas fired cooking appliances. This requirement appeared in Section 210.52 in the 1990 NEC and has been in Section 220-3 (b) of the NEC since the 1971 edition and possible earlier.

You may be confusing this with what was a common installation practice of placing the outside receptacles on the GFCI protected bathroom receptacle circuit. This practice has not been allowed since the 1999 edition of the NEC.

79. We had a final inspection on a single family home in the City of Milwaukee. The inspector has failed the job for having exposed wiring in the unfinished areas of the basement. For the most part the inspector is saying that we can't install romex stapled to a stud, running parallel to the stud (vertical), with one side of the stud dry-walled and the other side open in the unfinished area. The inspector is stating that the romex is subject to physical damage and that the unfinished area walls should be dry-walled. There is also an area of the wall that the electrician did install romex horizontally thru a studded wall that has one side dry-walled and the other side open in the unfinished area. I agree this could be a code violation, but the wire is drilled right below the ceiling. Do you feel these cables need to be covered?

    Answer: Typically not, NEC 300.4(D), 334.20, and 320.23

    Nonmetallic sheathed cable that is fastened parallel to studs must be 1 1/4 inches back from the face in accordance with Section 300.4 (D) of the NEC. Although SPS 16.300(2) deletes this section if it is fastened in this manner it is not considered subject to physical damage. If the NM cable is perpendicular to the studs it may be considered subject to physical damage where it is less than 7 feet from the floor. This is supported by NEC 334.20 where it says "The installation of cable in accessible attics or roof spaces shall also comply with 320.23." 320.23 says "Where run across the top of floor joists or within 7 feet of floor or floor joists across the face of rafters or studding, in attics and roof spaces that are accessible, the cable shall be protected by substantial guard strips that are at least as high as the cable."

    This language although applied to accessible attics is a reasonable guide for the possibility of physical damage for exposed wiring. If the cable closely follows the building surface as in parallel to studs, 1 1/4 inch from the surface and crosses them at a height of more than 7 feet from the floor it should not be in a position to suffer physical damage.

80. Can the receptacle for a cord and plug connected residential dishwasher be located in the basement? The installer drilled a hole thru the kitchen floor under the dishwasher and installed a receptacle in the unfinished basement floor joist area. This is not a new home but a full kitchen remodel.

    Answer: No, NEC 400.8(2) and 422.16(B)(2)

    The problem with putting the receptacle in the basement is that NEC 400.8(2) does not allow a flexible cord to be run through a hole in a floor, wall, or ceiling.

    The receptacle could be installed in an accessible space under the dishwasher (422.16(B)(2)(3) & (5) where the box is rigidly secured in place, or the receptacle could be installed in the adjacent cabinet if the cord and cap are installed to comply with 422.16(B)(1)(2) & (4).

81. We have a question about the receptacle located within 25' of an ac unit in 1-2 family construction. An electrician told us it was not required because of the exception listed at the bottom of 210.63. Is he right?

    Answer: No, NEC 210.63 Exception

    The exception can only be used for an evaporative cooler. These do not operate like an air conditioner. They are commonly referred to as a swamp cooler and cool the air by the evaporation of water not a refrigerant such as an AC unit uses. They work well in areas where the climate is hot and dry such as the SW part of the country however I have never seen one installed in our area.

    If it is in fact an evaporative cooler, which I doubt, he could use the exception otherwise the GFCI protected receptacle is required.

82. When the inspector completed the final inspection on a new home we recently completed he indicated we needed to add a receptacle on the wall behind the range. This home is wired for an electric range with no gas connection. I don't feel a receptacle is required. What do you think?

Answer: Not required, NEC 210.52(C)(1) Exception

210.52(C)(1) “Countertops” requires a receptacle to be installed in each wall countertop space that is 12” or wider. Receptacles are required to be placed so no point along the wall is more the 24”. The exception to 210.52(C)(1) indicates a receptacle is not required in the wall behind a range for the installation in Figure 210.52(C)(1). This indicates if there is less then 12” from the range to the wall a receptacle is not required.

210.52(A) “General Provisions” applies to wall space receptacles which includes kitchens.

83. I have a double meter pedestal at the lot line with a 200 amp main breaker for meter # 1 & a 100 amp main breaker for meter # 2. Are the underground Conductors from the meter pedestal to the circuit breaker panel in the building "Feeders" or are they still called "Service Entrance Conductors"?

Answer: Feeders, NEC Article 100 Definition

You indicate the service disconnects are located in the pedestal. The conductors (if any) between the utility and the first overcurrent device are service conductors. After the service overcurrent device the conductors supplied are either feeder or branch circuit conductors.

84. With the same double meter pedestal described in the prior question, can we install a feeder and 200 amp panel "for general circuitry" and 100 amp feeder and panel for a ground source heat pump, in the same building?

Answer: Yes, SPS 316.225(3)

NEC 225.30 allows only 1 feeder or branch circuit to a building however, 225.30(D) permits the installation of additional feeders or branch circuits “for different uses” such as the different metering rate for the heat pump. In this case the different feeder disconnects are not required to be grouped. A permanent plaque or directory shall be located at each disconnect location identifying the location of the other building disconnect (225.37). Each feeder disconnect shall connect to a common electrode system (250.32(A).

Had this been a single metered service SPS 316.225(3) tells us that in addition to

the requirements found in 225.30 we are allowed to have multiple feeders to a building if supplied from the same location, are rated 300 amperes or more, and they must supply not more then 6 disconnects located at the same location.

85. I am wiring a house and have (2) 150 ampere load centers fed from a 320 amp meter socket. We buried a # 1 bare copper wire from the well casing about 125' along the house footing to the first load center and then to the second. The pump installer welded a 3/8" bolt to the casing and we installed a copper lug for the ground wire. I feel the wire is one grounding electrode and the well casing is the second. Is this correct or do I have to add 2 ground rods as the inspector wants?

    Answer: No, NEC 250.50, 250.52(A)(8), 250.66

    I am assuming there are no other electrodes present as described in 250.52(A)(1) through (A)(7) and that you chose to use the metal well casing as an electrode. NEC 250.52(A)(8) recognizes "underground metal well casings that are not bonded to a metal water pipe" as "Other local metal underground systems or structures". There is no requirement to augment a metal well casing (only the single metal underground water pipe, rod, pipe & plate electrodes require supplemental & augmenting electrodes). The size of an electrode conductor to the well casing must comply with 250.66 and Table 250.66 (250.66 A, B & C do not apply).

86. I'm working with a client who plans to build a cabin in the woods. There will be no plumbing or HVAC system. They will not have power from the grid, but would like to have a photovoltaic system that would allow them to have a couple of electric lights. It's not clear to me whether having any electricity at all, from any source, makes it so that they would be required to have outlets on every wall and lights in every room. They don't want to get into a system that large, nor do they want to wire the house with devices that they won't have the power to use. Can you shed some light on this?

    Answer: Not a dwelling Art. 100

    Art. 100 describes a dwelling as a single unit which has permanent provisions for living, sleeping, cooking, and sanitation. Your question indicates there is no

plumbing so it probably does not have permanent provisions for sanitation and it does not mention permanent cooking provisions so it would probably not meet the definition of a dwelling and would not need to meet the requirements for receptacles in 210.52 or lighting found in 210.70. Check with your building or zoning inspector if they are considering it a dwelling.

While the electrical code does not require electrical to be installed if it is installed it needs to meet all applicable codes such as 210.8 for GFCI protection.

87. What is the specific code requirement for Electrical wires to be left accessible for inspection? My specific situation is the following. Three garage ceilings (20 x21) have been sheet rocked without a cleared inspection. I understood the inspection to have been completed. All of the wires are 100% exposed & are in clear sight from the top side. I understand that this is not the easiest way to inspect, but an inspection is clearly possible without removing all of the sheet rock. Thank you for your consideration.

    Answer: Inspection required, SPS 316.940(2)(b)(1)

    SPS 316.940(2)(b)(1) requires an inspection before the wiring is concealed. While, on occasion, I have personally completed an inspection where this has occurred it is not something I would allow on a regular basis. It is difficult to do a thorough inspection without actually entering the attic. Not something I want to do. An approved inspection notice should be left on the job site indicating it is OK to proceed with covering. If this is not done it is always a good idea to check with the inspector before proceeding.

88. I hope that you can help me with a clarification on grounding in a single family dwelling. We installed an underground service on a house, the house has a poured footing with no rebar, poured walls with rebar (all poured walls have some rebar) with foam on the exterior poured walls. We installed ground rods per code. The electrical inspector failed the job because we installed ground rods. He stated that we have to install a grounding ring under the basement floor instead of using ground rods. This being said, the inspector is basically saying that I can't install ground rods. The conflicting issue between the inspectors is if the poured wall is considered a foundation or footing in which we would have to connect a ground wire to the rebar.

Answer: Either ground rods or a ground ring is acceptable, NEC 250.52

While installing a ground ring would be one of the grounding electrodes allowed it is not required to be installed. NEC 250.52 lists the types of grounding electrodes and any that are present are required to be bonded together to form the grounding electrode system. If there were 20' or more of rebar installed in the footing it would have to be connected to the electrode system, however you indicated there is no rebar in the footings. If the foundation wall was in direct contact with the earth and had at least 20' of rebar it, the foundation rebar would qualify as a concrete encased electrode. However, you indicate the foundation is covered with exterior Styrofoam thus it is not considered as an electrode (not in direct contact with the earth). Because you do not have a concrete encased electrode, and I assume there is no metal underground water piping, you are left to select one of the other electrodes identified in 250.52(A). They would be (A)(2) grounded structural steel (not common for a 1 or 2 family dwelling), (A)(4) a ground ring, (A)(5) rod or pipe electrodes, or (A)(6), (7), or (8). A ground ring must encircle the building with a bare copper conductor sized per Table 250.66 buried a minimum 30" below the earth's surface. Sound a bit costly? This is the reason why most contractors opt for installing the two rod electrodes permitted by 250.52(A)(5) and SPS 316.250(1).

89. For a furnace replacement, can we reconnect to the existing circuit that is shared with other loads?

Answer: Typically Yes, SPS 316.003(3)

The branch circuit described is existing and reconnection of a new furnace to the same existing branch circuit is treated as a repair. The existing branch circuit is required to be in compliance with the code in effect at the time of installation. The requirement for an individual branch circuit to supply "central heating equipment" became effective in Wisconsin on 11/1/90 with the adoption of 1990 NEC 422.7. Previous editions of the Code only required compliance with 210.23 where other loads shared the branch circuit with the furnace. NEC 210.23 remains applicable to the existing branch circuit installation and needs to be verified for compliance.

The installation of a new branch circuit shall comply with the present 2008 NEC 210.23 and 422.12. A new separate branch circuit may be required by SPS 316.110(1) if the manufacturer's instructions for the new furnace specifically

require a separate/ individual branch circuit, a branch circuit rated greater than the existing branch circuit rating, or the connecting of the new furnace to the existing branch circuit creates a violation of 210.23.

90. I have a property owner that built an accessory structure in 2004 with no power and recently built a new home on the property. He ran a feeder panel to the accessory building (100 amp) single phase three wires and no grounding conductor. This was caught at final inspection. I believe he needs the grounding conductor to the structure based on the NEC 2008 code because this is a new premise wiring. His argument is the accessory structure was existing and I explained to the owner that the wiring was installed after the 2008 code was adopted therefore he needs to install a grounding conductor. Am I interpreting the code correctly?

    Answer: Yes, equipment ground is required 250.32(B)

    I agree with you regarding the installation of the new feeder to the structure. The feeder was installed during the 2009 Comm 16 and the adopted 2008 NEC. The feeder is required to comply with the 2008 NEC 250.32(B) which requires an equipment grounding conductor to be installed with the feeder and the separation of neutrals and equipment grounds at the new panel per 250.142(B). The exception to 250.32(B) only applies to existing feeders (installed prior to March 1, 2009) not the existing structure. The requirement of a grounding electrode (250.32(A) at the separate structure is also required.

91. Don't switches located closer than 3' to the edge of a bathroom shower be GFIC protected? I can't seem to find anything in the "08" code book. Any help would be greatly appreciated.

    Answer: No, NEC 404.4

    Take a look at the last sentence of 404.4 “Switches shall not be installed within wet locations in tub or shower spaces unless installed as part of a listed tub or shower assembly. The switch may be located anywhere outside the tub or shower space

92. My question pertains to a residential permanent swimming pool installation. NEC 680.21(5) Cord and Plug Connections. The statement in this section that says pool associated motors shall be permitted to employ cord and plug connections, does this allow for a choice to hard wire the motor? In this example, there is a motor rated snap switch for disconnecting.

    Answer: Yes, NEC 680.21

    Any of the wiring methods mentioned in 680.21(A)(1) could be used for the entire installation. Section 680.21(A)(5) acts as an exception to 680.21(A)(1). So cords would be an permitted only if installed to meet all of the conditions in 680.21(A)(5) which would limit it's length to no more then 3' and having an equipment grounding conductor complying with 250.122 but not smaller than #12 per 608.21(A)(1). If you decide to use a cord 680.22(A)(1) requires a GFCI protected twist lock type receptacle located at least 6' away from the pool wall. The receptacle shall comply with 430.108, 430.109(F), 422.33(A) , and 422.33(C). A HP rated snap switch would also be permitted as the motor disconnect according to 430.109.

93. We are building a home in Union Grove, WI and I could not find the information in the codes. My question is do I need to install a separate circuit for the sump pump?

    Answer: Typically yes, NEC 210.23(A)(2)

    These sump pumps are typically supplied with a cord and cap. NEC 210.50 requires the receptacle for a specific appliance to be located within 6' of the appliance (and within reach of the appliance code). NEC 210.23(A)(2) requires the sump pump rating (Utilization equipment fastened in place) not to exceed 50% of the general-branch circuit rating where other loads such as lighting or other receptacles are also supplied. This equates to a maximum 1/3 HP pump motor on a shared 15 ampere general-purpose branch circuit assuming other known loads plus the pump motor do not exceed the overall rating of the branch circuit. You may want to check with the owner whether he would be bothered by the dimming of lights every time the pump starts.

94. When we did the rough-in on a new kitchen we installed the counter top receptacle boxes so they would be flush with the finished wall. The owner decided to install ceramic tile above the counters and now the boxes are recessed approximately ¼" back. Do you think this will be a problem?

    Answer: Not for ¼" or less, NEC 314.20

    In walls, or ceilings with a surface of gypsum, concrete, plaster, or other non-combustible material 314.20 allows the box to be mounted not more then 1/4" back from the surface. Many grills or oven surfaces are ceramic or porcelain so these products have a very high tolerance of heat and would be considered non-combustible and a box would not require an extension ring if located less then 1/4" from the finished surface.

95. In a laundry room of dwelling unit do I need to install a receptacle outlet to serve the countertop? Also, if there is no sink in the counter would I have to GFCI protect the receptacle?

    Answer: No and Typically not, NEC 210.52 and 210.8(A)(7)

    The key is the fact that you described the area as a laundry room. NEC 210.52 (A) lists rooms that are required to have receptacles installed in compliance with 210.52(A)(1) thru (3). The laundry room is not listed.

    210.52(F) indicates at least one receptacle be installed for the laundry but does not indicate that any receptacle is required to be located to serve the counter top.

    210.50(C) indicates where a receptacle is installed for a specific appliance it shall be located within 6' of the intended location of the appliance. This required receptacle outlet may be located above the counter top however, it would not be required. NEC 210.8(A)(7) requires GFCI protection of any receptacle located within 6' of a sink including a laundry tray/ sink. This would be required whether or not the sink is installed into the countertop or free standing.

96. Could you please give me your view of the following question? A new house has two and half bathrooms. The 2nd floor master bathroom has two sinks and two receptacles in it. The next full bathroom on the 2nd floor has one sink and one

receptacle in it. The half bathroom is on the 1st floor and has one sink and one receptacle in it. Can one 20 amp branch circuit supply the two and half bathrooms on one GFCI?

Answer: Only the receptacle outlets, NEC 210.11(C)(3)

Yes, providing the required 20 ampere bathroom branch circuit supplies only the receptacle outlets in the two and one half bathrooms. No lights, fans, hydromassage bathtubs, and etc may connect to this common 20 ampere bathroom receptacle circuit.

97. An HVAC sub has noted that it is “against code” to put a bathroom exhaust fan inside a shower. Is this true?

Answer: No, SPS 316.110(1)

The NEC does not specifically prohibit installing an exhaust fan in a shower. NEC 110.3(A) requires that equipment be approved for the installation. I have seen many exhaust fans that are listed to be installed in a shower. Providing the fan (appliance) is installed per the listing and manufacturer’s instructions there shouldn’t be a problem.

The NEC doesn’t have specific language requiring GFCI protection for an exhaust fan located within a shower space however, SPS 316.110(1) requires compliance with the installation instructions and listing which do require GFCI protection to be installed for the fan. DSPS 323.02(3)(d) indicates the minimum CFM of a bathroom exhaust fan to be at least 50. The NEC does not indicate the location of the fan.

98. I have a new single family dwelling under construction. The main service entrance panel is located in a finished living area. The panel is recessed between the studs so that the metal panel access cover fits flush on the drywall. For cosmetics, the builder has installed a shallow frame and door assembly over the metal access door on the panel. The frame and door of this wooden assembly is so close that in order for the metal access panel cover to be removed, the hinges on the wooden door assembly need to be removed first. Do you feel this will this be OK?

Answer: No, NEC 110.26 and 312.3

Access to the wiring within the panel must be maintained without removing the hinges or any other part of the building or building finish. This concept is expressed in the first sentence of 110.26. Panelboards are part of a cabinet and 312.3 requires a cabinet to be installed flush with the combustible wall surface (not recessed behind combustible wood trim). This requirement is similar to a flush outlet box installed in association with wall paneling or into a wood cabinet back panel. Another issue is also expressed in 240.24(A) Accessibility, overcurrent devices are required to be readily accessible (not just the handle of the circuit breaker sticking out).

99. At a recent final inspection on a new home I found the well pump wires were not protected in conduit below the ground surface. The information on the conductors indicated they were 12 gauge “submersible pump wire” (Type THW 12 AWG-yellow, red, black) and they were direct buried to the home, even the label on the roll of pump wire states "for use within the well casing". Is this OK?

    Answer: No, NEC 310.13, Articles 338 and 340, SPS 316.012(2) and SPS 316.110(1)

    Cables identified for use as direct burial cable will typically be type UF or perhaps USE (in larger sizes) as indicated in Art. 340 and 338 of the National Electrical Code. They would be identified as such on the outer insulation or covering of the cable. NEC 310.13 indicates conductors and cables comply with the applicable provisions of Table 310.13. Type THW is not allowed by Table 310.13 to be direct buried rather it is required to be installed within a continuous raceway. NEC 300.3 requires all conductors of the same circuit be installed in the same raceway or cable. SPS 316.110 indicates listed and labeled equipment shall be installed in accordance with their listing and labeling. Where type USE or UF cable is installed, NEC 300.5 requires those direct buried cables to be protected by enclosures or raceways extending from the minimum 18” distance below grade required by Table 300.5 to a point at least 8' above finished grade.

    I noticed that there only 3 ungrounded conductors mentioned. NEC 250.112(L) and (M) are required to be bonded to the appliance branch circuit equipment grounding conductor.

100. We are starting to see more instantaneous water heaters being installed. My question is do we need to look at these as a continuous load when doing our load calculations?

Answer: No, NEC 422.13 and Article 100 Definition

This is an instantaneous water heater not a storage type water heater thus 422.13 does not apply. NEC422.13 indicates a storage type water heater of 120 gal. or less shall be considered for continuous load when sizing circuits. Art. 100 definitions indicates a continuous load is where the maximum current is expected to continue for 3 hours or more. Typically an instantaneous electric water heater would not be in use continuously for 3 hours or more.